



(12)

EUROPEAN PATENT APPLICATION

- (43)

Date of publication:  
17.01.2024 Bulletin 2024/03
- (51)

International Patent Classification (IPC):  
F16K 27/00 (2006.01) B60T 17/04 (2006.01)  
B60S 1/48 (2006.01)
- (21)

Application number: 22315143.2
- (52)

Cooperative Patent Classification (CPC):  
F16K 27/003; B60S 1/481; B60T 17/046
- (22)

Date of filing: 12.07.2022

- (84)

Designated Contracting States:  
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB  
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO  
PL PT RO RS SE SI SK SM TR  
Designated Extension States:  
BA ME  
Designated Validation States:  
KH MA MD TN
- (72)

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VALVE ASSEMBLY

- (57)

The invention concerns a valve assembly (1) comprising:  
- a fastening element (10) provided with a fastening body and some fastening islands, the fastening plate being of longitudinal shape along a direction of elongation, and configured to be fastened in an automotive vehicle by its rear face, the fastening body comprises some through openings aligned along the direction of elongation, each fastening island being housed in a through opening, and  
being mechanically bonded to the fastening body by flexible means;  
- some valve (20) provided with a casing, said valve (20) being configured to be removably mounted, in a mounted position, to a fastening island by a front face opposite to the rear face, via attachment means, said attachment means being configured to mount the valve (20) to a fastening island according to a sliding movement and/or a rotating movement.

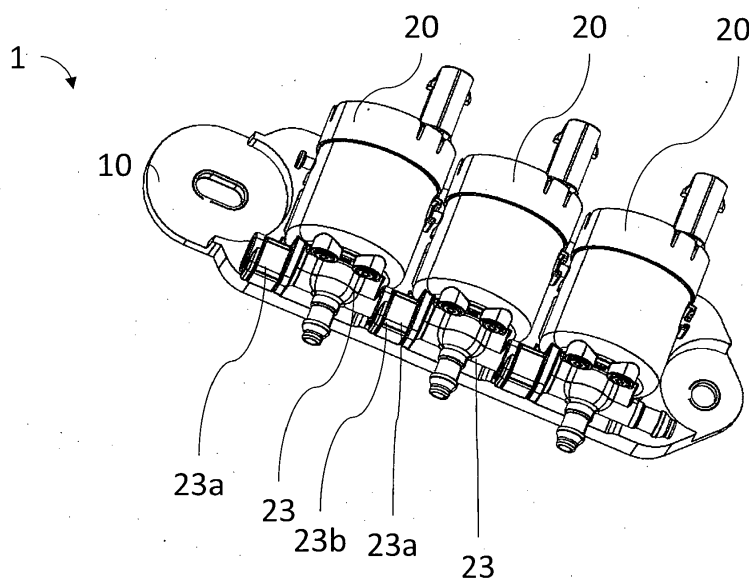


Figure 1

## Description

### FIELD OF THE INVENTION

[0001] The present invention relates to a valve assembly. In particular, the present invention concerns a valve assembly configured for cleaning at least one sensor of an automotive vehicle and in particular an autonomous vehicle.

### DESCRIPTION OF THE RELATED ART

[0002] Automotive vehicles are now equipped with many sensors, cameras, lidars or radars (hereinafter "sensors") for driving assistance purposes. These sensors may be located inside or outside the vehicle in order to offer the driver a complete visibility of the environment in which the vehicle is located. For example, sensors may be located in the bumper, in the side-skirt, on the side mirror, behind the windshield, under the hood, nearby the headlamps, on a roof pod.

[0003] However, these sensors, exposed to the environment, are likely to be covered with dirt or dust, and consequently may encounter performance degradations. Frequent cleanings of these sensors are therefore required to guarantee their performances.

[0004] In this respect, automotive vehicles may be provided with a cleaning system comprising valves which are generally mounted in extremely dense areas, so that said valve assembly requires a compact packaging.

[0005] In addition, there are situations for which a modularity and a scalability of a valve assembly are needed. Notably, the number of valves needed may depend on the number of surfaces or sensors to be cleaned.

[0006] One purpose of the present invention is therefore to propose a valve assembly which is compact and can be easily operated when a maintenance is required.

[0007] Another purpose of the present invention is to propose a valve assembly which is modular and scalable.

### SUMMARY OF THE INVENTION

[0008] The purposes of the present invention are, at least partly, achieved by a valve assembly in a vehicle, the valve assembly comprising:

- a fastening element provided with a fastening body and a plurality of fastening islands, the fastening body being of longitudinal shape along a direction of elongation, and configured to be fastened in a vehicle, each fastening island having a face, said fastening face, and being mechanically bonded to the fastening body by flexible mean;
- at least one valve provided with a casing, said valve being configured to be removably mounted, in a position said mounted position, to one of the fastening islands by the fastening face of said fastening island, via attachment means, said attachment means be-

ing configured to mount the valve to one of the fastening islands according to a sliding movement and/or a rotating movement.

5 [0009] According to one embodiment, the valve assembly further comprises locking means configured to lock a valve mounted on a fastening island into its mounted position.

10 [0010] According to one embodiment, the flexible means comprise spring elements.

15 [0011] According to one embodiment, the fastening body comprises a plate provided with a plurality of through openings, extending from a front face towards a rear face of said plate, and aligned along the direction of elongation, each of the fastening island being housed in one of the through openings so that the attachment means are accessed by the front face.

20 [0012] According to one embodiment, the spring elements extend from a contour of the fastening islands towards a sidewall delimiting the through opening housing the considered fastening island.

25 [0013] According to one embodiment, the fastening body comprises a rod having a square or a rounded section, the fastening islands being mechanically bonded to said fastening body to its lateral surface via the flexible means.

30 [0014] According to one embodiment, the spring element is intercalated in between a face of the fastening element opposite to its fastening face, and the lateral surface.

[0015] According to one embodiment, the spring element comprises at least one flexible ring.

35 [0016] According to one embodiment, the attachment means comprise sliding means, the sliding means being provided with a first sliding component and a second sliding component, cooperating together, and located, respectively, on a side surface of the casing and on the fastening face of the fastening island.

40 [0017] According to one embodiment, the first sliding component and the second sliding component are arranged so that, the assembling of the valve to one of the fastening islands involves a sliding movement in a plane defined by the fastening face and along a direction, said sliding direction, perpendicular to the direction of elongation.

45 [0018] According to one embodiment, the first sliding component and/or the second sliding component are arranged so that the sliding movement can also be executed along a direction opposite to the sliding direction.

50 [0019] According to one embodiment, the locking means comprises a flexible tab and a stop, the flexible tab being integral with one or the other of the fastening island and the casing of the valve, while the stop being located on the other of the fastening island and the casing of the valve, the flexible tab being arranged to cooperate with the stop to lock the valve in the mounted position.

55 [0020] According to one embodiment, the at least one valve comprises a fluid supply conduit extending along

the direction of elongation from an inlet towards an outlet, said fluid supply conduit being configured to laterally distribute a fluid injected into the inlet to the considered valve.

**[0021]** According to one embodiment, the fluid supply conduit of a valve has its outlet fluidly connected to the inlet of the fluid supply conduit of a valve immediately adjacent in the direction of elongation.

**[0022]** According to one embodiment, the valve and the valve immediately adjacent are dual valve.

**[0023]** According to one embodiment, the valve and the valve immediately adjacent each comprise a second fluid supply conduit, the second fluid supply conduit extending along the direction of elongation from a second inlet towards a second outlet, said second fluid supply conduit being configured to laterally distribute a second fluid injected into the second inlet to the considered valve.

**[0024]** According to one embodiment, the second fluid supply conduit of the valve has its second outlet fluidly connected to the second inlet of the second fluid supply conduit of the valve immediately adjacent.

**[0025]** The invention also concerns a vehicle provided with at least one valve assembly according to the present invention.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0026]** Other features and advantages will be better understood after reading the following description of the valve assembly according to the invention, provided as non-limiting examples only, with reference to the accompanying drawings in which:

Fig. 1 is a diagrammatic representation of a valve assembly according to a first embodiment of the present invention;

Fig. 2 is a diagrammatic representation from the front face of the fastening element implemented in the valve assembly of figure 1;

Fig. 3 is a view from the front face of the fastening island represented in figure 2, in particular the figure 3 allows the observation of the flexible means;

Fig. 4 is a perspective view of the fastening island of figure 3 for the observation of the second sliding component;

Fig. 5 is a perspective view of a valve of the valve assembly of figure 1;

Fig. 6 is a perspective view of the fastening island represented in figure 2;

Fig. 7 is a diagrammatic representation of a fastening element according to a third embodiment of the present invention.

## DETAILED DESCRIPTION OF THE INVENTION

**[0027]** In the descriptive part, the same references in the drawings may be used for elements of the same type.

5 The drawings are schematic representations which, for the sake of readability, are not necessarily to scale.

**[0028]** The present invention concerns a valve assembly for the cleaning of sensors, cameras, lidars or radars (hereafter "sensors"), notably for the cleaning of sensors of an automotive vehicle.

**[0029]** In particular, the present invention concerns a valve assembly for an automotive vehicle, the valve assembly comprising:

- 15 - a fastening element provided with a fastening body and a plurality of fastening islands, the fastening body being of longitudinal shape along a direction of elongation, and configured to be fastened in an automotive vehicle, each fastening island having a face, said fastening face, and being mechanically bonded to the fastening body by flexible means;
- 20 - at least one valve provided with a casing, said valve being configured to be removably mounted, in a position said mounted position, to one of the fastening islands by the fastening face of said fastening island, via attachment means, said attachment means being configured to mount the valve to one of the fastening islands according to a sliding movement and/or a rotating movement.

**[0030]** According to specific embodiments, the fastening body can comprise at least one of the elements chosen among: a plate, a rod.

**[0031]** However, the invention shall not be limited to those specific embodiments.

**[0032]** The Figure 1 is a diagrammatic representation of a valve assembly 1 according to a first embodiment of the present invention.

**[0033]** Notably, the valve assembly 1 comprises a fastening element 10 and at least one valve 20. The valve assembly 1 represented in figure 1 comprises three valves. However, the present invention shall not be limited to this aspect so that the skilled in the art may consider a different number of valves 20. In particular, and according to the present invention, the valve assembly is both modular and scalable. In other words, the skilled in the art, depending on the space available for installing said valve assembly into an automotive vehicle and the needs in terms of fluid distribution, may consider to adapt the valve assembly. As non-limiting examples, the valve assembly 1 can be installed in at least one of the locations chosen among: engine compartment, bumper, fender, roof, quarter panel, trunk tailgate.

**[0034]** The figure 2 is a diagrammatic representation of the fastening element 10. Notably, the fastening element 10 comprises a fastening body 11 and at least one fastening island 12, for example two fastening island 12.

**[0035]** The fastening body 11 is of longitudinal shape

along a direction of elongation XX'. In this specific embodiment, the fastening body 11 comprises a plate having a front face 11a and a rear face 11b opposite to the front face.

**[0036]** By "longitudinal shape", it is meant that the length of the fastening body is at least two times its width.

**[0037]** For example, the length of the fastening body 11 can be in the 100 mm to 200 mm range. Similarly, the width of the fastening body 11 can be in the 30 mm to 80 mm range. Similarly, the thickness of the fastening body 11 can be in the 8 mm to 20 mm range.

**[0038]** The plate forming the fastening body 11 has a front face 11a and a rear face 11b opposite to the front face 11a. In particular, the fastening body 11 is configured to be fastened in an automotive vehicle by its rear face 11b. To this regard, the fastening of the fastening body 11 may be implemented with attaching means, and for example a double side adhesive tape, or screws.

**[0039]** The plate forming the fastening body 11 also comprises through openings 13 aligned along the direction of elongation XX' (figure 3).

**[0040]** Each through opening 13 may be of square or rectangular shape, and eventually with rounded corners. Notably, each through opening 13 is delimited by a sidewall 13a.

**[0041]** As depicted in figure 2 and according to the present invention, each fastening island 12 is housed in a through opening 13, and is mechanically bonded to the fastening body by flexible means 14a. Notably, the flexible means 14a may comprise spring elements extending from a contour of the fastening islands 12 toward the sidewall delimiting the through opening housing the considered fastening island 12. More particularly, the fastening island 12 may be maintained suspended into the through opening via the spring elements. In the example depicted in figure 2, each fastening island 12 may be bonded to the fastening body by four spring elements, and particularly by four V-shape spring elements.

**[0042]** The consideration of the flexible means 14a renders the valve assembly less sensitive that vibrations caused by the use of a valve mounted on said assembly.

**[0043]** The at least one valve 20 may comprise an e-valve described in the European patent application EP 3792535 A1. In particular, the at least one valve 20 comprises a casing 21 delimited at least by a side surface 22. According to the present invention, the valve 20 is configured to be removably mounted, in a position said mounted position, to one of the fastening islands 12 by the front face 11a of the fastening body 11 opposite to the rear face 11b.

**[0044]** Notably, the assembly of a valve 20 to a fastening island 12 involves attachment means which are configured to mount the valve to one of the fastening islands according to a sliding movement and/or a rotating movement.

**[0045]** Therefore, the attachment means may comprise sliding means. To this regard, the sliding means may comprise a maintained guide, and for example dove-

tail type means. In particular and as illustrated in figure 4 and figure 5, the sliding means may be provided with a first sliding component 31 and a second sliding component 32, cooperating together, and located, respectively, on a side surface 22 of the casing 21 and on a face, said fastening face 12a of the fastening island 12 and opposite to the rear face 11b of the fastening body. The cooperation between the first sliding component 31 and the second sliding component 32 is a sliding cooperation. In particular, the first sliding component 31 and the second sliding component 32 can comprise, respectively, a counter-slider and a slider (figure 4 and figure 5).

**[0046]** Notably, the first sliding component 31 and the second sliding component 32 may be arranged so that the assembly of the valve 20 to one of the fastening islands 12 involves a sliding movement in a plane defined by the front face 11a and along a direction, said sliding direction, perpendicular to the direction of elongation XX'. The invention shall not be limited to those sole sliding directions. In a complementary or alternative way, the assembling of the valve 20 to one of the fastening islands 12 may involve a sliding movement along the direction of elongation.

**[0047]** Advantageously, the first sliding component 31 and/or the second sliding component 32 are arranged so that the sliding movement can also be executed along a direction opposite to the sliding direction.

**[0048]** The invention is not limited to the implementation of sliding means as previously described. In particular, the assembling of a valve to one of the fastening islands 12 may involve a rotating movement.

**[0049]** The valve assembly further comprises locking means configured to lock a valve 20 mounted on a fastening island 12 into its mounted position.

**[0050]** For example, the locking means may comprise a flexible tab and a stop. To this regard, the flexible tab 40 is integral with one or the other of the fastening island 12 and the casing 21 of the valve, while the stop 42 is located on the other of the fastening island 12 and the casing 21 of the valve 20. Notably, the flexible tab 40 comprises a lug 41 arranged to cooperate with the stop 42 to lock the valve 20 in the mounted position (figure 5 and figure 6). The present invention is not limited to this sole aspect, and the skilled in the art can consider any other suitable locking means. Notably, in case the assembling of the valve can be executed by a sliding in one and the other of the sliding direction and of the opposite direction, lugs 41 can be positioned at the ends of the counter slider.

**[0051]** The valve 20 can comprise a fluid supply conduit 23 extending along the direction of elongation XX' from an inlet 23a towards an outlet 23b. Said fluid supply conduit 23 is configured to laterally distribute a fluid injected into the inlet to the considered valve.

**[0052]** Advantageously, and as illustrated in figure 1, the fluid supply conduit 23 of a valve 20 has its outlet 23b fluidly connected to the inlet 23a of the fluid supply conduit 23 of a valve 20 immediately adjacent in the direction

of elongation.

**[0053]** The present invention also concerns a second embodiment which differs from the first embodiment in that the valve 20 and the valve 20 immediately adjacent are dual valves. Notably, the valve 20 and the valve 20 immediately adjacent each comprise, in addition to the fluid supply conduit 23, a second fluid supply conduit 24. The second fluid supply conduit 24 extending along the direction of elongation from a second inlet 24a towards a second outlet 24b. Said second fluid supply conduit is notably configured to laterally distribute a second fluid injected into the second inlet 24a to the considered valve 20. For example, the fluid injected in a fluid supply conduit 23 may be a liquid, while the fluid injected in the second fluid supply conduit is a gas.

**[0054]** Advantageously, the second fluid supply conduit 24 of the valve has its second outlet 24b fluidly connected to the second inlet 24a of the second fluid supply conduit 24 of the valve immediately adjacent.

**[0055]** The invention also concerned a third embodiment which differs from the first and the second embodiment in that the fastening body comprises a rod rather than a plate. Notably, the rod can comprise a square-like or a circular-like shape.

**[0056]** According to this third embodiment illustrated in figure 7, the fastening islands 12 are mechanically bonded to the rod forming the fastening body 11 to its lateral surface 11c via the flexible means, and notably by a spring element.

**[0057]** In particular, a spring element is intercalated in between a face of the fastening element opposite to its fastening face, and the lateral surface. To this regard, the spring element comprises at least one flexible ring.

**[0058]** The present invention also concerns an automotive vehicle provided with at least one valve assembly according to the present invention.

**[0059]** Of course, the invention is not limited to the embodiments described and variant embodiments can be made without departing from the scope of the invention as defined by the claims.

## Claims

1. A valve assembly (1) for a vehicle, the valve assembly (1) comprising:

- a fastening element (10) provided with a fastening body (11) and a plurality of fastening islands (12), the fastening body (11) being of longitudinal shape along a direction of elongation, and configured to be fastened in a vehicle, each fastening island (12) having a face, said fastening face, and being mechanically bonded to the fastening body (11) by flexible means (14a);
- at least one valve (20) provided with a casing (21), said valve (20) being configured to be removably mounted, in a position said mounted

position, to one of the fastening islands (12) by the fastening face of said fastening island (12), via attachment means, said attachment means being configured to mount the valve (20) to one of the fastening islands (12) according to a sliding movement and/or a rotating movement.

2. The valve assembly (1) according to claim 1, wherein the valve assembly (1) further comprises locking means configured to lock a valve (20) mounted on a fastening island (12) into its mounted position.

3. The valve assembly (1) according to claim 2, wherein the flexible means (14a) comprise spring elements.

4. The valve assembly (1) according to claim 3, wherein the fastening body (11) comprises a plate provided with a plurality of through openings (13), extending from a front face towards a rear face of said plate, and aligned along the direction of elongation, each of the fastening island (12) being housed in one of the through openings so that the attachment means are accessed by the front face.

5. The valve assembly (1) according to claim 4, wherein the spring elements extend from a contour of the fastening islands (12) towards a sidewall (13a) delimiting the through opening (13) housing the considered fastening island (12).

6. The valve assembly according to claim 3, wherein the fastening body (11) comprises a rod, advantageously having a square or a rounded section, the fastening islands (12) being mechanically bonded to said fastening body to its lateral surface via the flexible means.

7. The valve assembly according to claim 6, wherein the spring element is intercalated in between a face of the fastening element opposite to its fastening face, and the lateral surface, advantageously the spring element comprises at least one flexible ring.

8. The valve assembly (1) according to one of claims 1 to 7, wherein the attachment means comprise sliding means, the sliding means being provided with a first sliding component (31) and a second sliding component (32), cooperating together, and located, respectively, on a side surface (22) of the casing (21) and on the fastening face of the fastening island (12), the first sliding component (31) and the second sliding component (32) being arranged so that, the assembling of the valve (20) to one of the fastening islands (12) involves a sliding movement in a plane defined by the fastening face (11) and along a direction, said sliding direction, perpendicular to the direction of elongation.

9. The valve assembly (1) according to claim 8 wherein the first sliding component (31) and/or the second sliding component (32) are arranged so that the sliding movement can also be executed along a direction opposite to the sliding direction. 5
10. The valve assembly (1) according to claim 9, wherein the locking means comprises a flexible tab (40) and a stop (42), the flexible tab (40) being integral with one or the other of the fastening island (12) and the casing (21) of the valve (20), while the stop (42) being located on the other of the fastening island (12) and the casing (21) of the valve (20), the flexible tab (40) being arranged to cooperate with the stop (42) to lock the valve (20) in the mounted position. 10  
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11. The valve assembly (1) according to one of claims 1 to 10, wherein the at least one valve (20) comprises a fluid supply conduit (23) extending along the direction of elongation from an inlet (23a) towards an outlet (23b), said fluid supply conduit (23) being configured to laterally distribute a fluid injected into the inlet (23a) to the considered valve (20). 20
12. The valve assembly (1) according to claim 11, wherein the fluid supply conduit (23) of a valve (20) has its outlet (23b) fluidly connected to the inlet (23a) of the fluid supply conduit (23) of a valve (20) immediately adjacent in the direction of elongation. 25  
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13. The valve assembly (1) according to claim 12, wherein the valve (20) and the valve (20) immediately adjacent are dual valve, and wherein the valve (20) and the valve (20) immediately adjacent each comprise a second fluid supply conduit (24), the second fluid supply conduit (24) extending along the direction of elongation from a second inlet (24a) towards a second outlet (24b), said second fluid supply conduit (24) being configured to laterally distribute a second fluid injected into the second inlet (24a) to the considered valve (20). 35  
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14. The valve assembly (1) according to claim 13, wherein the second fluid supply conduit (24) of the valve (20) has its second outlet (24b) fluidly connected to the second inlet (24a) of the second fluid supply conduit (24) of the valve (20) immediately adjacent in the direction of elongation. 45
15. A vehicle provided with at least one valve assembly (1) according to one of claims 1 to 14. 50

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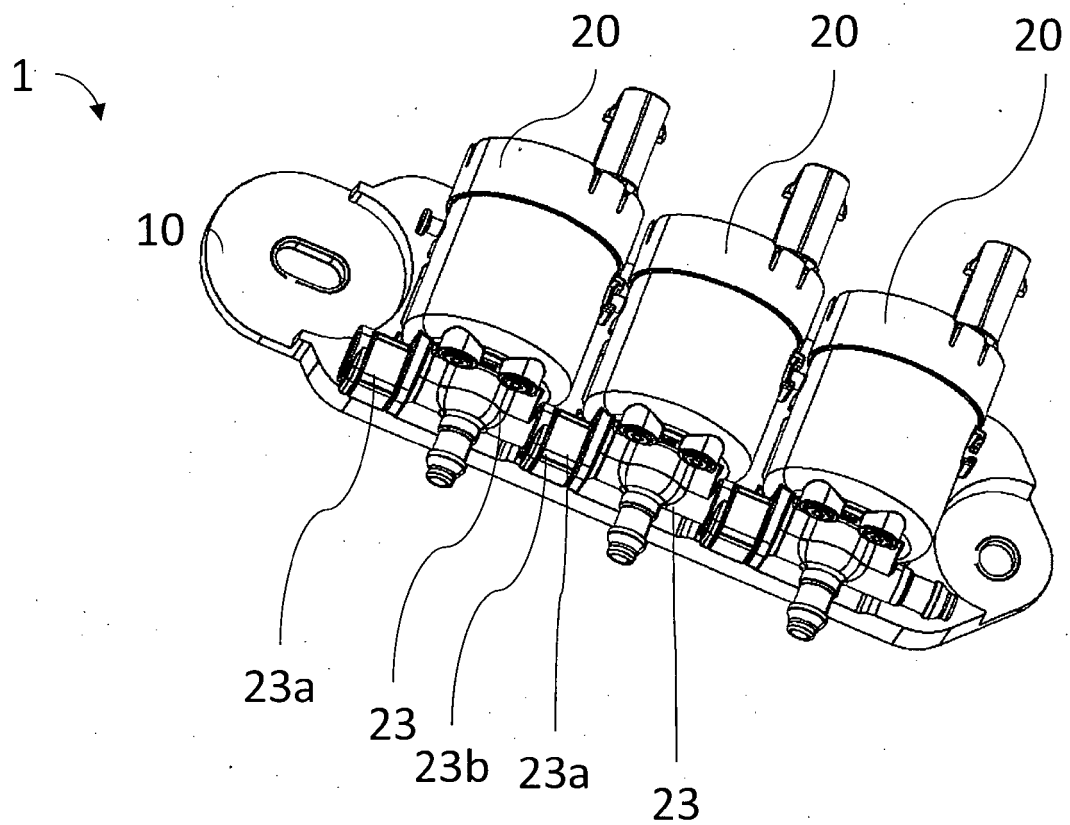


Figure 1

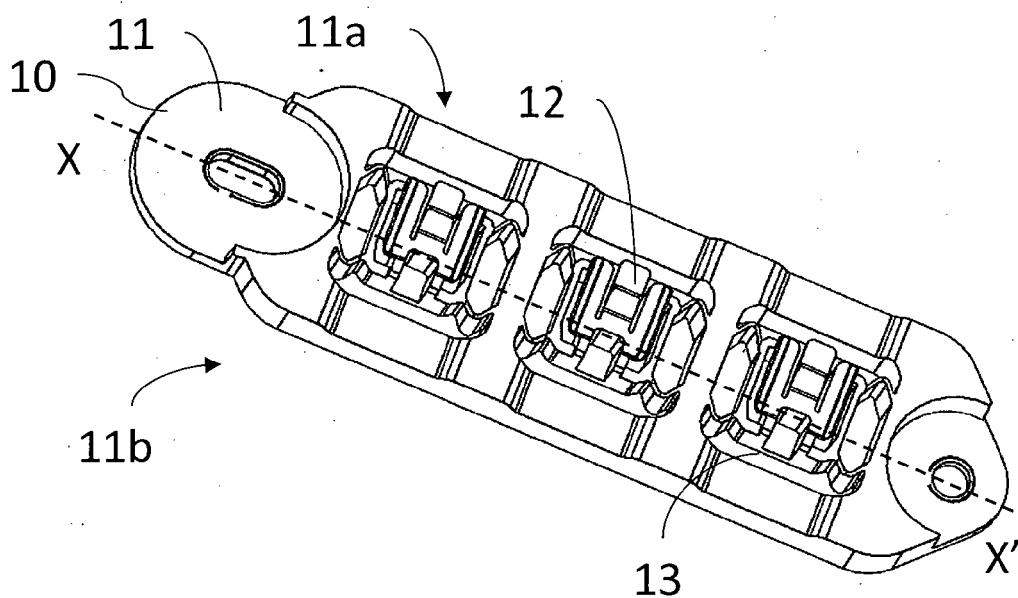


Figure 2

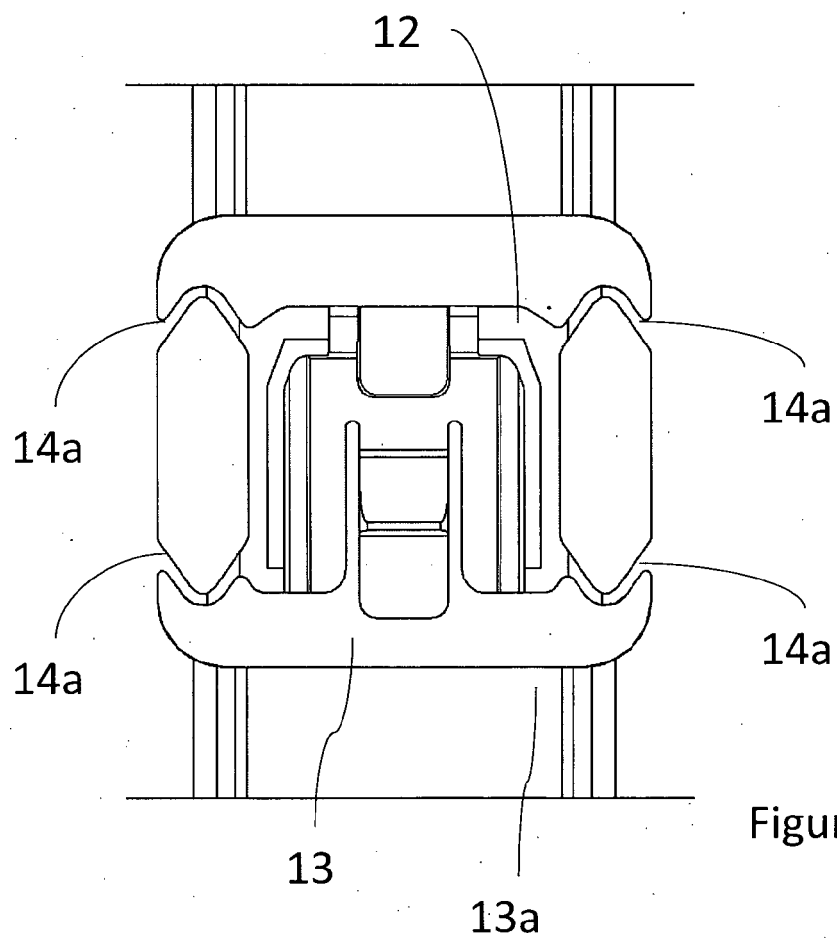


Figure 3



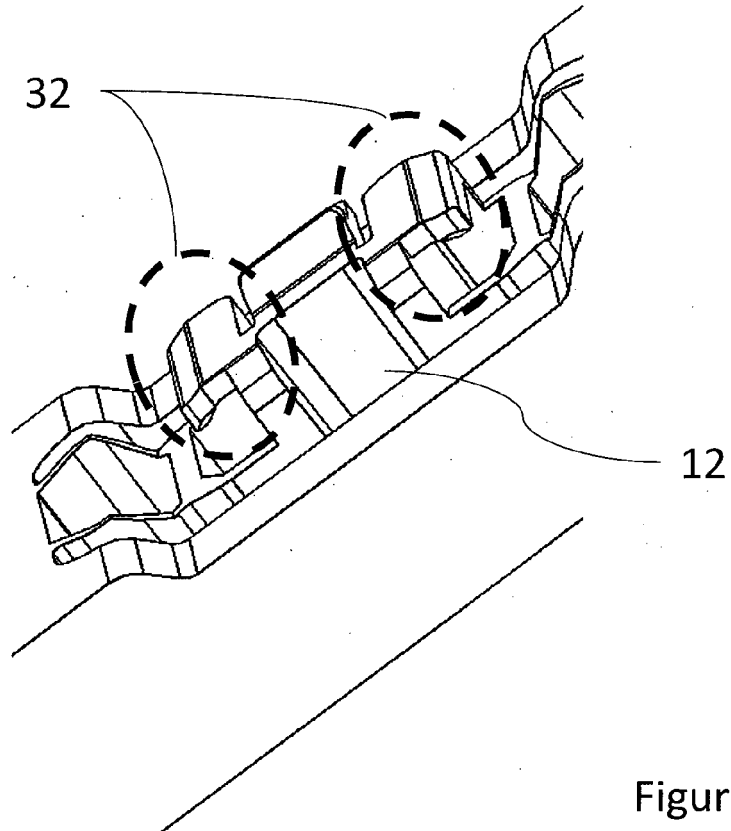


Figure 4

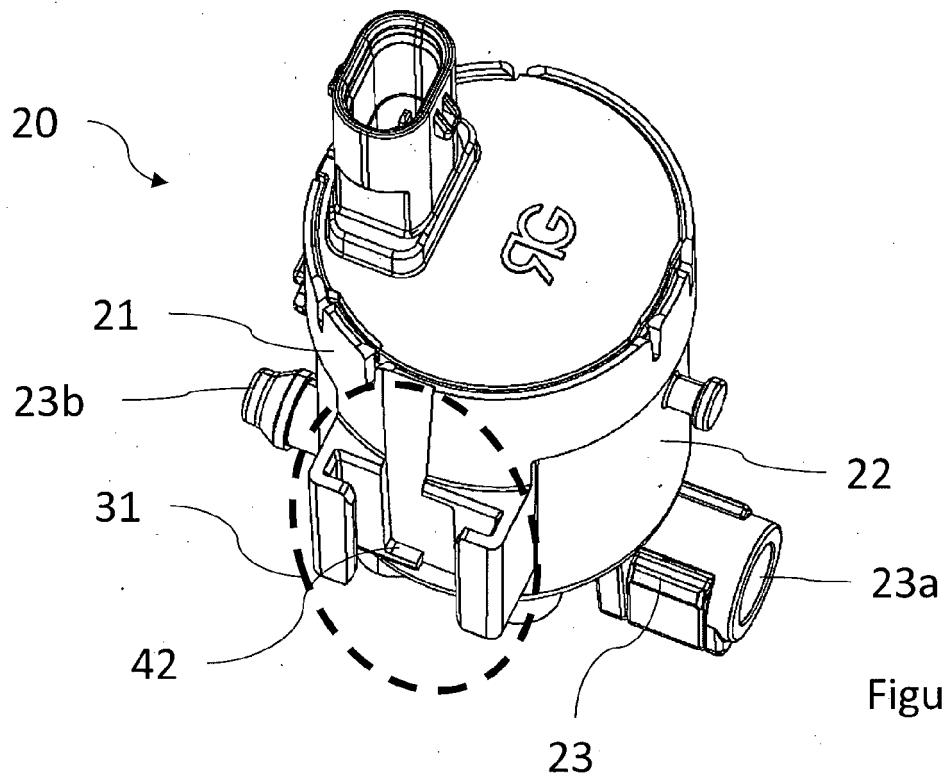


Figure 5

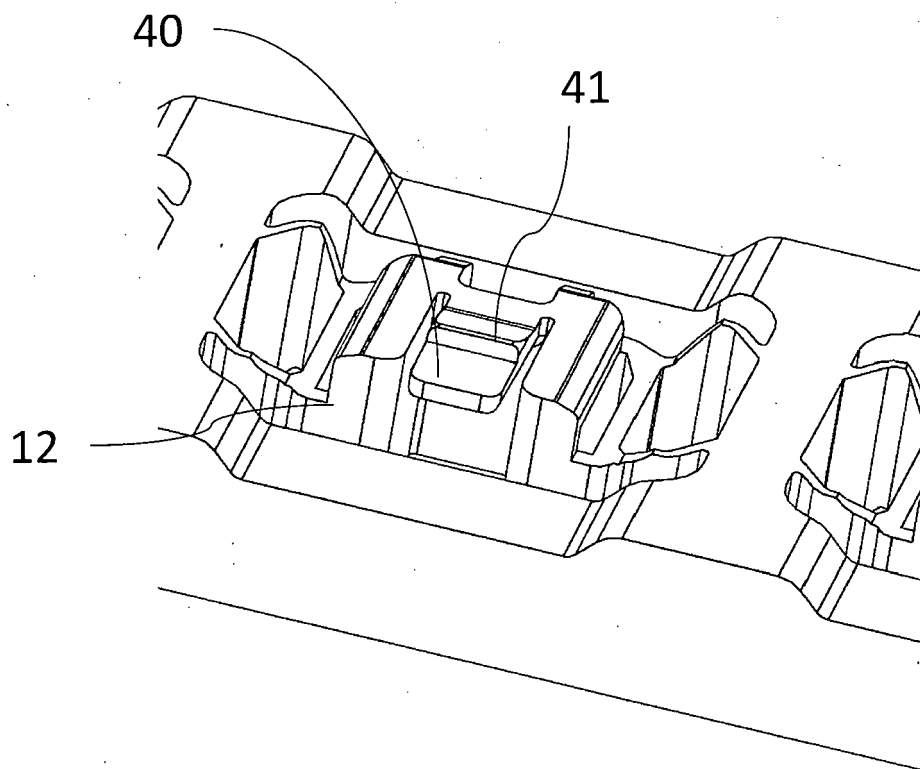


Figure 6

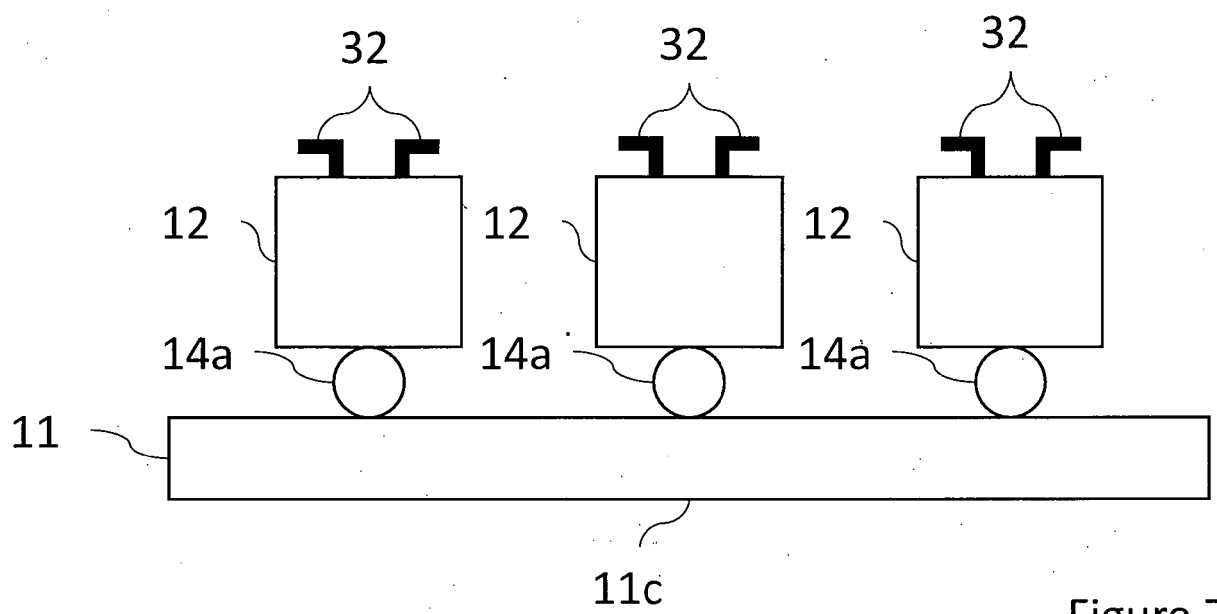


Figure 7



## EUROPEAN SEARCH REPORT

Application Number

EP 22 31 5143

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The present search report has been drawn up for all claims			
Place of search <b>The Hague</b>		Date of completion of the search <b>16 January 2023</b>	Examiner <b>Grunfeld, David</b>
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... & : member of the same patent family, corresponding document	

**ANNEX TO THE EUROPEAN SEARCH REPORT  
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EP 22 31 5143

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
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**REFERENCES CITED IN THE DESCRIPTION**

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